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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/632,910	08/04/2000	Kohei Tatsumi	52433/609	1969

26646 7590 04/03/2002

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EXAMINER

CHAMBLISS, ALONZO

ART UNIT	PAPER NUMBER
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2827

DATE MAILED: 04/03/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/632,910

Applicant(s)

BALL, MICHAEL B.

Examiner

Alonzo Chambliss

Art Unit

2827

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 February 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 16-26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 16-26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. The amendment B filed 2/6/02 has been fully considered and made of record as Paper No. 6. Therefore, claims 1-15 have been canceled.

Response to Arguments

2. Applicant's arguments with respect to claims 16-26 have been considered but are moot in view of the new ground(s) of rejection.

Specification

3. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. The following title is suggested: " METHOD OF FABRICATING A SEMICONDUCTOR PROVIDED WITH LOW MELTING POINT METAL BUMPS ".

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of

the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 16-18, 20-22, 25, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Juskey, Jr. et al. (U.S. 4,940,181).

With respect to Claims 16, 17, and 20-22, Juskey discloses electrodes 18, 20, 22 formed on a chip carrier substrate 10 (see Figs. 1-3). Juskey discloses that the solder bumps can be used with chip carrier or other member are well known in the art (see col. 1 lines 13-17). One skilled in the art would readily recognize that a semiconductor chip would be considered as an "other member", since a semiconductor chip is formed from a wafer substrate that has been sliced into individual chips. Therefore, it would have been obvious to use the semiconductor chip in replace of the carrier substrate, since a semiconductor chip is formed from a wafer substrate that has been sliced into individual chips. Each bump 30 consists of a spherically formed metal ball having a given size, and adhesive bonded to the electrodes 18, 20, and 22 for the attachment of the bumps 30. Each electrode 18 includes a layer of an electrode material 20 and at least one layer 22 laminated to the layer of the electrode material 20 to avoid deterioration (i.e. strengthen and protect) bonding such that the at least one layer 22 has a peripheral dimensions substantially the same as those of the electrode material 20. The metal

balls 30 are adhesively bonded to the respective electrodes with a flux 26. The at least one layer 22 has a thickness (i.e. .04 mils) smaller than the electrode material 20 thickness (i.e. .15 mils). The metal balls 30 are reflowed (see col. 2 lines 35-60 and col. 3 lines 33-39; Figs. 2-4).

With respect to Claims 18, applying the flux 26 to the electrodes 18, 20, 22 (see Fig. 3; Col. 3 lines 26-34).

With respect to Claims 25 and 26, the bumps 30 consisting of metal balls are adhesively bonded to the respective electrodes 18, 20, 22 of the semiconductor substrate 10 (i.e. semiconductor chip) (see col. 3 lines 26-40; Fig. 4).

6. Claims 19, 23, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Juskey, Jr. et al. as applied to claims 16 and 20 above, and further in view of Okuyama (JP 4-65130).

Juskey fails to disclose wherein the metal balls are adhesive bonded to the electrodes by a process comprising the steps of applying vibration at a small amplitude to a vessel containing the metal balls to cause the metal balls to jump up. Arranging and holding the metal balls on an arrangement base plate by attracting the jumping up metal balls to attraction openings provided in the arrangement base plate in positions corresponding to the electrodes of the semiconductor chip to which the metal balls are to be adhesive bonded. Removing excess metal balls adhering either to the arrangement base plate or to the metal balls attracted to the attraction openings and simultaneously contacting the metal balls held and arranged on the arrangement base plate with the electrodes of the semiconductor chip. However, with respect to Claims 19

and 23, Okuyama discloses wherein the metal balls 8 are adhesive bonded to the electrodes 6 by a process comprising the steps of applying vibration at a small amplitude to a vessel containing the metal balls 8 to cause the metal balls 8 to jump up. Arranging and holding the metal balls 8 on an arrangement base plate 29 by attracting the jumping up metal balls 8 to attraction openings 31 provided in the arrangement base plate 29 in positions corresponding to the electrodes 6 of the semiconductor chip 2 to which the metal balls 8 are to be adhesive bonded. Removing excess metal balls 8 adhering either to the arrangement base plate 29 or to the metal balls 8 attracted to the attraction openings 31 and simultaneously contacting the metal balls 8 held and arranged on the arrangement base plate 29 with the electrodes 6 of the semiconductor chip 2 (see English abstract and all of the figures). Therefore, it would have been obvious to use vacuum device with Juskey, since the vacuum device would automatically form high density solder bumps and simultaneously mount a plurality of solder bumps on electrode pads of the chip as taught by Okuyama.

Conclusion

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within

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TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.


The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. It is cited primarily to show processes of packaging a semiconductor device, which are similar to the process of the instant invention.

Any inquiry concerning the communication or earlier communications from the examiner should be directed to Alonzo Chambliss whose telephone number is (703) 306-9143. The fax phone number for this Group is (703) 308-7722 or 7724.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-7956.

AC

AC/March 30, 2002


DAVID L. TALBOTT
PRIMARY EXAMINER
ART UNIT ~~2825~~
2827